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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/715,468	11/19/2003	Gan-Lin Hwang	0941-0869P	3761

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EXAMINER	
BERRIOS, JENNIFER A	

ART UNIT	PAPER NUMBER
1613	

NOTIFICATION DATE	DELIVERY MODE
09/30/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary	Application No.	Applicant(s)	
	10/715,468	HWANG ET AL.	
	Examiner	Art Unit	
	Jennifer A. Berrios	1613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 July 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-7,9-12,14,16-20 and 22-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-7,9-12,14,16-20 and 22-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This office action is in response to the reply filed 7/7/2010, wherein claims 1 and 14 have been amended and claims 2, 8, 13, 15, 21 and 26 have been cancelled.

Currently claims 1, 3-7, 9-12, 14, 16-20 and 22-25 are pending examination.

Rejections and/or objections not reiterated from previous office actions are hereby withdrawn. The following rejections and/or objections are either reiterated or newly applied, as the newly added limitations are different in breadth and scope. They constitute the complete set presently being applied to the instant application.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 7/7/2010 has been entered.

Response to Arguments

Applicant argues that Nakamoto/Ruoff/Lieber and Iwamura fail to disclose that the carbon nanocapsule has no metal material between the carbon nanocapsule.

This is not persuasive. Applicant is directed to the above rejection which references Smalley to cure this deficiency.

Applicant further states that the embodiment of page 6, discloses functionalized carbon nanocapsules which are electroplated with an electroplating solution which has no metal material added into the electroplating solution.

This is not persuasive. Examiner would like to note that page 6 of the spec simply recited "electroplating solution." It is conventional in the art that electroplating occurs in the presence of metal, furthermore, applicant contemplate the use of metal ions in the elctrolating solution, and the instant spec gives no reason to believe that the metal ions are not present in the electroplating solution. Applicant is invited to provide evidence that clearly establishes that the electroplating solution utilized contains no metal ions, through demonstration of lab notebooks, etc.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any

evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1, 3-7, 9-12, 14, 16-20 and 22-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamoto (US 2002/0060514, pub. Date: 5/23/2002), Ruoff et al (US 5,547,748, issued: 8/20/1996), Lieber et al (US 6,159,742, issued: 12/12/2000) and Iwamura et al (US 2002/0061397, pub. Date: 5/23/2003) and Smalley (US 2002/0127171).

Nakamoto teaches a field emission cold cathode of a lateral type, a manufacturing method thereof, and a vacuum micro-device (Pg 1 [0003]). Under these circumstances, in a field emission cold cathode device of a lateral type and a vacuum micro-device using it, a device structure and a manufacturing method that can achieve low driving voltage, high emission efficiency, and a high integration degree are sought for (Pg 1 [0012]). Despite applicant's limitation of a nanocapsule, no difference is seen between the nanocapsule of the present invention and the nanotube of Nakamoto. Nakamoto teaches that fullerenes and carbon nanotubes are both allotropes of carbon and are basically the same nature. Furthermore the fullerene are hollow, but an onion-like fullerene in which many layers of low-order fullerenes fill a high-order fullerene like an onion exists [0053]. Furthermore a fullerene can also nest a metal in its hollow portion [0055].

Regarding claims 1, 5, 14 and 18: Nakamoto teaches a method of depositing fullerenes or carbon nanotubes onto a substrate by an electroplating process performed for about 4 minutes, the plating layers have a thickness of about 4 and 0.5 micrometers (Pg 5 [0071-0072]) and are performed by an electroplating process (Pg 5 [0064]). The electroplating process is further described in Sheet 4, Figures 7A-C. As such it's expected that the process taught by

Nakamoto results in a nanocapsule thin film, as the process steps described by Nakamoto are the same process step described in instant claims 1 and 14.

Regarding claims 6-7 and 19-20: Nakamoto discloses an electroplating process having voltage sets at 100V, 10V and 0V (pg 5 [0071]). It would have been obvious to one of skill in the art to vary the potential of the external electrical field, especially since Nakamoto describes another embodiment with a driving voltage of about 7V (Pg 5 [0068]), considering that 6V is about 7V.

Nakamoto fails to teach the carbon nanocapsule used to make the carbon nanocapsule thin film to comprise a functional group that carries at least one charge after dissociation, as recited by claims 1, 9-12, 14 and 22-25. Nakamoto also fails to teach the carbon nanocapsule to be hollow or metal filled with a polyhedral structure having a balls-within-balls structure or a concentric multi-layer of closed graphite sheet structure, as recited by instant claims 1, 3-4, 14 and 16-17.

Rouff teaches the encapsulation of metals inside of multi-layers polyhedral shells of carbon/graphite (nanoencapsulates). Many materials, such as metals, metal-carbides, transition metals, alloys, etc can be encapsulated. Some of these nanoencapsulates exhibit ferromagnetic and paramagnetic properties and have uses in the biomedical field as well as in recording media and composite materials (Abs). The nanoencapsulate has a polyhedral outer shell of nested, concentric layers of carbon (multi-layers of concentric closed graphite sheet structure) and the outer diameter of the nanoencapsulated is preferably between 10nm and 500nm (Col. 2, lines 31-40).

The nanoencapsulates may be reactive at the strained corners, enabling them to be derivatized or functionalized with a variety of molecules, such as amines (defined by the instant claims to have a positive charge after dissociation), thiols and carbanions. Chemical modification of nanoencapsulates will be useful for changing their physical properties such as

solubility to enable purification, and for attaching other chemical and/or biochemically active species (Col. 8, lines 52-67).

Lieber teaches a carbon-based nanotube, bonded at the end with a linking group. The linking group can include a functional moiety selected from the group consisting of amino, amido, carbonyl, carboxyl (defined by the instant claims to have a negative charge after dissociation), alkyl, aryl, ether and ester (Col. 1, lines 55-62). These nanotubes have a diameter of 1-200nm. Lieber defined the term nanotube to mean a hollow article (Col. 2, lines 25-26).

Iwamura teaches an onion-like carbon thin film and methods of producing said thin film, with a film thickness of 20nm or more and has clusters of an onion-like carbon thin film, in which each cluster has a diameter of 4nm or more. This carbon-thin film of the present invention is very useful in terms of availability in various industrial fields, as a hard protective film or a solid lubricating film, etc (Abs.). Fig. 2 of Iwamura clearly demonstrates balls-within-balls structures with a polyhedral shape.

It would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Nakamoto/Ruoff/Lieber and Iwamura to arrive at the instant invention. One of skill in the art would have been motivated to substitute the carbon nanocapsules taught by Nakamoto with the metal filled carbon nanoencapsulated taught by Ruoff or the hollow carbon nanotubes taught by Lieber, as both Ruoff and Lieber teach carbon nanotubes/capsules comprising functional groups bonded to the carbon to achieve a desired set of results, such as ferromagnetic and paramagnetic properties or chemical modifications that change the physical properties of the carbon nanocapsule, such as solubility and for attachment of other chemical species, as taught by Rouff. One of skill in the art would have also known that the internal structure of the carbon nanocapsules could vary and be concentric multi-layers of a closed graphite sheet structure or an onion-like structure (balls-within-balls structure), as both

were well known in the art at the time the invention was made and one of ordinary skill in the art would have been motivated to elect one or the other depending on the desired results. Finally one of skill in the art would expect reasonable success because Nakamoto teaches carbon nanotubes/nanocapsules that can be hollow, or comprise a metal in the hollow portion, and which can comprise multi-layers of carbon, such as an onion would.

Nakamoto/Ruoff/Lieber and Iwamura do not disclose the thin film to have no metal material between the carbon nanocapsules.

Smalley teaches a purification process for carbon nanotubes. The purification process removes the extraneous carbon as well as metal-containing residual catalyst particles. Smalley teaches a process for producing high-purity carbon nanotube material (Abs). The carbon nanotube material contains less than about 0.1 wt% metal [0028]. Smalley further teaches that the presence of metallic particles reduces the temperature at which nanotube material remains stable. High purity nanotubes, with the transition metal species substantially removed, would provide greater chemical stability to the nanotubes and a longer performance life to applications involving them.

It would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Nakamoto/Ruoff/Lieber/Iwamura and Smalley. One of skill in the art would have been motivated to purify the carbon nanocapsule thin film taught by Nakamoto/Ruoff/Lieber/Iwamura, as Smalley teaches the benefits of having high purity carbon nanotubes with no metal present, furthermore the degree of purification is optimizable depending on the desired effect, such as greater chemical stability. One of skill in the art would have a reasonable expectation of success absent evidence to the contrary.

Conclusion

No claims are allowable.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Berríos whose telephone number is (571)270-7679. The examiner can normally be reached on Monday-Thursday: 7:00am-4:00pm (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Kwon can be reached on (571) 272-0581. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jennifer A Berríos/
Examiner, Art Unit 1613

/Tracy Vivlemore/
Primary Examiner, Art Unit 1635